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THE KING SALMON OF COOK INLET, ALASKA

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THE KING SALMON OF COOK INLET, ALASKA

by

Robert M. Yancey and Fredrik V. Thorsteinson

United States Fish and Wildlife Service
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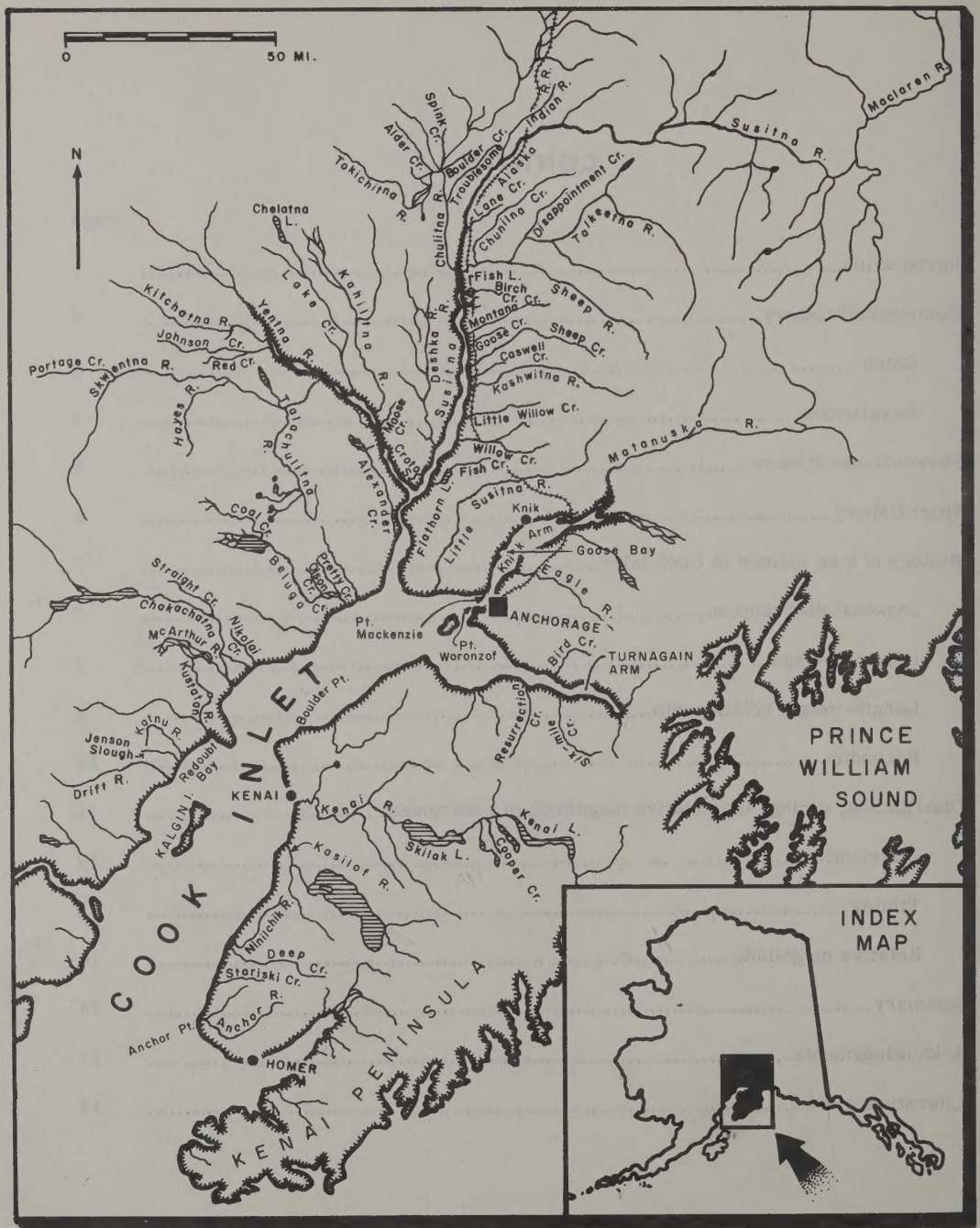

Figure 1.--Cook Inlet, Alaska, showing salmon streams where major king salmon runs occur.

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ABSTRACT

Runs of king salmon *(Oncorhynchus tshawytscha)* in Cook Inlet, Alaska, are declining. Paucity of information concerning the species led to an investigation in 1958 and 1959. Catch data show that the decline is real and not the result of restrictive regulations. The personal-use and sport fisheries are important factors affecting king salmon runs.

Age groups 4_2, 5_2, and 6_2 occurred most frequently. Age group 6_2 was dominant in 1958, 5_2 in 1959. Shifts in the average size between 1958 and 1959 are associated with shifts in age-group dominance. A significant linear regression of the number of eggs on length was calculated.

Surveys to determine distribution, timing, and magnitude of the escapement proved impractical because of glacial melt, the vast area involved, and the great number of tributary streams used for spawning.

INTRODUCTION

Historically, the king salmon *(Oncorhynchus tshawytscha)* is one of the most important species of salmon in the Cook Inlet area of Alaska (fig. 1). As early as 1787, Russians traded them to the English for Hawaiian produce. Native Alaskans and early settlers utilized them heavily for food for their families and work dogs.

Runs of king salmon in the Cook Inlet area underwent a severe decline between 1953 and 1959. To reach their spawning grounds, king salmon had to pass through a commercial and personal-use (subsistence) fishery in salt water and a personal-use and sport fishery in fresh water. Concern over the decline and the effects of this fourfold exploitation and also over the lack of information on the biological characteristics of the king salmon prompted a study by the Bureau of Commercial Fisheries during the fishing seasons of 1958 and 1959. The study was essentially an inventory and had the following objectives: (1) to review the commercial fishery catch and regulations; (2) to learn the magnitude, location, and catch of the personal-use and sport fisheries; (3) to

collect and analyze biological statistics; and (4) to determine the distribution, timing, and relative magnitude of the escapement. This paper presents the findings under the headings of the four objectives.

COMMERCIAL FISHERY

Catch

Most king salmon taken for commercial purposes in Cook Inlet are canned, and the remainder are used for other markets--fresh, frozen, mild-cured, pickled, or smoked. Production for these markets has not been reported consistently, and total amounts or values are not known for any one year. Such information as is available is presented in table 1. Since it is not known if the figures given represent total production, their only value may be to serve as an indication of the variety of uses.

The best available measure of abundance of king salmon in Cook Inlet is the canned pack, which has been reported consistently since 1923 (table 2 and fig. 2). The pack moved steadily upward until 1951 when a record high was reached. Since 1954 annual packs have declined.

In the Cook Inlet commercial fishery king salmon are taken with set gill nets, which have one end fastened to shore, and drift gill nets, which float free with the tidal currents. Until 1959 they also were taken by traps, but in that year the State of Alaska banned the use of traps.

Set gill nets are fished along both the east and west sides of the inlet and around the shore of Kalgin Island (fig. 1). Drift gill nets are fished in the offshore waters of the inlet, mainly between Kalgin Island and the west shore. Most of the commercial catch is taken by set gill nets. In 1959, for instance, set gill nets took 71.5 percent of the catch; drift gill nets, 17.2 percent; and traps, 11.2 percent. In 1959 set gill nets took 79.5 percent and drift gill nets 20.5 percent.

Regulations

The Bureau of Commercial Fisheries regulated fishing effort by limiting the length of gear fished and the size of the mesh and by adjusting the amount of fishing time within the season. Set gill nets could not exceed 35 fathoms in length, and the aggregate length of set gill nets used by any fisherman could not exceed 105 fathoms. Drift gill nets could not exceed 150 fathoms in length. No minimum length was stipulated.

Mesh regulations were in effect between May 25 and June 30, the time when most king salmon migrate through Cook Inlet. During this period all nets were restricted to 8 1/2 inches, stretch measure, except for optional use of 35 fathoms of 5 1/2-inch-mesh net, which was allowed for catching early running sockeye salmon.

The principal means of regulating fishing effort was in the reduction of fishing time. Before 1949 a weekly closed period of 36 hours (1800 Saturday to 0600 Monday) was the only time limitation on fishing. In 1949 and 1950 the weekly closed period was increased to 48 hours, and in 1951 the year of the record catch (table 2), it was increased to 84 hours. The following year, it was decreased to 72 hours. From 1953 to 1959 the weekly closed period was 120 hours, which allowed two 24-hour fishing periods a week.

Reducing fishing time did not stop the decline of king salmon. Annual packs in 1953 and 1954, when fishing was permitted for only two 24-hour periods a week, compare closely with the packs in years when fishing was permitted for longer periods. Yet, annual packs from 1955 to 1959 declined drastically, and since they were achieved under the same regulations as the packs of 1953 and 1954, the decline cannot be attributed solely to shorter fishing seasons.

Data that demonstrate the decline are limited. Information concerning catch and effort is available only for the period from 1956 to 1959 (table 3). Set gill net catches are used because they represent major portions of the catch and should therefore reflect changes in abundance. Effort is expressed in set net days and represents the number of set gill nets multiplied by the number of days fished. Despite relatively stable fishing effort between years, the average catch per net day was lower

Table 1. --Products (other than canned) of Cook Inlet king salmon, 1951-59

[Data from Statistical Unit, Bureau of Commercial Fisheries, Juneau.]

Year	Fresh		Frozen		Mild-cured		Pickled		Smoked	
	Pounds	*Dollars*	*Pounds*	*Dollars*	*Pounds*	*Dollars*	*Pounds*	*Dollars*	*Pounds*	*Dollars*
1951	---	---	71,075	22,741	---	---	8,200	2,200	---	---
1952	---	---	18,910	6,874	5,625	2,213	5,400	1,706	---	---
1953	---	---	63,783	20,411	41,600	12,480	---	---	---	---
1954	584	175	59,400	16,672	---	---	---	---	1,225	848
1955	---	---	40,260	13,000	83,775	35,991	---	---	---	---
1956	4,660	1,859	76,186	34,401	66,580	31,910	---	---	200	200
1957	---	---	---	---	40,150	20,600	---	---	360	360
1958	6,815	3,397	24,666	14,396	24,000	11,600	---	---	---	---
1959	45,746	---	82,140	---	6,046	---	---	---	1,930	---

Table 2. --Commercial canned pack and value, Cook Inlet king salmon, 1923-59

[Data from Pacific Fisherman Yearbooks.]

Year	Cases (48 one-pound cans)	Wholesale value	
		Per case	Total
	Number	*Dollars*	*Dollars*
1923	6,933	8.57	59,416
1924	5,681	9.03	51,299
1925	10,629	13.44	142,854
1926	14,541	10.37	150,790
1927	27,530	12.11	333,388
1928	17,213	9.87	169,892
1929	16,966	10.44	177,125
1930	19,388	12.02	233,044
1931	13,180	9.05	119,279
1932	17,912	5.36	96,008
1933	14,710	8.42	123,858
1934	19,148	3.02	57,827
1935	18,803	9.54	179,381
1936	19,723	7.81	154,037
1937	24,674	9.83	242,545
1938	16,060	8.00	128,480
1939	16,554	10.00	165,540
1940	15,995	9.85	157,551
1941	26,719	12.58	336,125
1942	28,501	15.92	453,736
1943	31,195	15.74	491,009
1944	25,636	15.83	405,818
1945	22,182	16.22	359,792
1946	19,939	19.76	393,995
1947	30,535	24.57	750,245
1948	32,541	26.70	868,845
1949	31,979	25.17	804,911
1950	31,959	28.54	912,110
1951	59,488	28.40	1,689,459
1952	22,937	26.71	612,647
1953	28,952	25.65	742,619
1954	23,995	26.76	642,106
1955	15,034	28.65	430,724
1956	16,947	31.28	530,102
1957	12,274	32.37	397,309
1958	6,599	30.83	203,447
1959	7,057	29.50	208,182

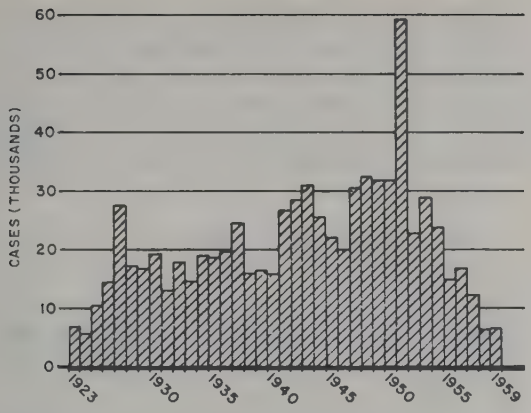

Figure 2.--Commercial canned pack of Cook Inlet king salmon 1923-59. (Case is forty-eight 1-pound cans.)

after 1956, further indicating the decline is probably real and not a result of the regulations.

PERSONAL-USE FISHERY

The personal-use fishery is extensive in Alaska. Subsistence fishing was essential to survival in the early days of Alaska's development, particularly to the natives and homesteaders in remote areas. Because of their large size, excellent quality, and early appearance in the season, king salmon were heavily utilized.

In 1958, Alaska fishery regulations provided that residents could take salmon for personal use with commercial fishing gear. No license, permit, or registration was required, and no catch or possession limit was stipulated. Personal-use fishing was regulated by closing certain areas and streams to all fishing and by limiting the length of gill nets and the distance between them. Further, commercial fishing regulations were applied to the personal-use fishery during the commercial fishing season.

Set gill nets in the personal-use fishery could be no more than 15 fathoms in length per fisherman and had to be set at least 100 yards apart. Before 1959 the personal-use fishery was prosecuted in salt water and in many of the fresh-water streams utilized by king salmon. In 1959 the regulations were modified to permit net fishing in fresh water for personal use on the main stem of the Susitna River only. Here the set gill nets had to be

Table 3. -- Numbers of king salmon in weekly set gill net catches, Cook Inlet, May 25 to June 30, 1956-59

Statistical week number 1/	1956		1957		1958		1959	
	Set net days	Catch	Set net days	Catch	Set net days	Catch	Set net days	Catch
21	150	3,429	---	---	---	---	---	---
22	259	4,780	261	8,566	317	4,795	231	2,684
23	299	15,019	392	9,233	311	4,413	299	7,242
24	306	8,114	432	7,323	314	3,729	325	8,708
25	281	4,741	379	2,755	286	1,388	291	3,993
26	224	763	358	691	273	313	278	842
Total	1,519	36,846	1,822	28,568	1,501	14,638	1,424	23,469
Average per net day		24.2		15.7		9.8		16.5

1/ A statistical week, which begins on Sunday and ends on Saturday, is the unit of time used by the Bureau in Alaska for recording catch statistics.

shorter than 30 feet in length and fished at least 100 yards from any other set net or any tributary stream. Regulations for taking fish from salt water for personal use were not changed in 1959.

The effect of the personal-use fishery on king salmon runs is unknown because no registration of nets or report of catches was required. During the 1958 season an effort was made to learn the magnitude and locations of the personal-use fisheries. Areas where personal-use fisheries were known to exist were surveyed from the air; and the number of nets in the water, identified as personal-use from their length, were counted (table 4). Occasionally it was possible to land at a net site and interview the owner on the spot. Additional catch data were obtained from owners of personal-use nets living in the Anchorage area. Extrapolations from the data taken in the interviews led to an estimated total catch of 3,025 fish. Based on the 12-year average of 3.18 fish per case, this amounts to 951 cases of salmon, equivalent to one-sixth of the 1958 commercial pack.

SPORT FISHERY

The sport fishery has grown in Alaska as population and transportation facilities have increased. The areas near population centers are subject to heavier fishing pressure each year. Roads into the Matanuska Valley, into parts of the Susitna River Valley, and on the Kenai Peninsula have been built or improved in recent years. Private airplanes are increasing in number and are being used to

Table 4. -- Nets observed and estimated king salmon caught in Cook Inlet personal-use set gill net fishery, 1958

Net sites	Greatest number of nets observed	Estimated catch
Fresh water		
Alexander Creek	3	200
Susitna River	3	200
Deshka River	5	250
Fish Creek (Flathorn Lake)	2	425
Montana Creek	1	100
Matanuska River	5	250
Total	19	1,425
Salt water		
Resurrection Creek	1	20
Sixmile Creek	1	20
Pt. Woronzof to Anchorage	43	860
Anchorage to Eagle River	7	140
Knik Village Vicinity	5	100
Goose Bay	6	120
Goose Bay to Point Mackenzie	7	140
Ninilchik River	0	1/ 200
Total	70	1,600

1/ Catch estimated by native residents.

reach formerly inaccessible places such as Alexander Creek and the Deshka River on the west side of the inlet. Since 1951 daily passenger service by the Alaska Railroad has provided cheap and convenient transportation to the lower Susitna River tributaries such as Willow and Montana Creeks (fig. 1).

The sport fishery is carried out only in fresh water because of the extreme tidal ranges, rough water, and glacial turbidity in the salt-water fishing areas. We did not inventory the sport fishery in 1958, but previous surveys made on the Anchor River and on streams on the Kenai Peninsula provide some information and show that the sport fishery plays an important role in the area's economy. In 1954 an estimated 3,000 anglers spent 15,000 man hours on the Anchor River.[1] In 1955 the calculated number of fishermen on the Anchor River was 5,228 and on streams on the Kenai Peninsula, 20,450, an estimated 83,322 man days of fishing.[2] In 1957, 5,800 man days of fishing was estimated for the Anchor River.[3] This report also stated that fishing followed an unusual pattern that year, with the lowest effort in May and June. The king salmon runs are the largest for the season during these 2 months, and usually the greatest number of fishermen are reported then.

BIOLOGY OF KING SALMON IN COOK INLET

The commercial catch by the set and drift gill net fisheries was sampled for length and age in 1958 and 1959. To maintain catch identity with gear, area, and time, sampling was carried out on the fishing grounds from a cannery tender. In 1959 additional data were collected for length-weight relationships and for fecundity. Catch data in 1959 were collected by the Bureau of Commercial Fisheries Statistical Unit in Juneau.

Seasonal Distribution

The seasonal distribution of the king salmon catch for 1959 is shown by the weekly catch for statistical areas in figure 3. Statistical areas are geographical units assigned number designations for convenience in reporting the location of a catch. The weeks referred to in the graph began on May 24 and are numbered consecutively. After the 12th week, catches of king salmon decrease, whereas catches of other salmon species, which are caught with gear of a different mesh size, increase.

Peak catches occur earlier in areas near the latitude of Anchor Point than in inner areas. In areas along the Kenai Peninsula shore south of Boulder Point, the king salmon areas have a bimodal pattern, for peak catches occurred during weeks 1 to 4 and 8 to 12 (fig. 3).

Length and Age

Lengths were measured from mideye to fork of tail and recorded by sex, which was determined by examining the gonads. Age was determined from scales. Samples were taken from each of the 9 fishing days between May 25 and June 30 in both 1958 and 1959. In 1958 length measurements were taken from 1,463 fish, and age was determined for 621. One scale was taken from each fish for determining age, but 41 percent of the scales were regenerated and had to be discarded because they were of no value for determining age. In 1959, therefore, several scales were taken from each fish. With the larger selection to choose from, only 11 percent of the scale samples had to be discarded because of regeneration. Length measurements were taken from 1,705 fish, and age was determined for 1,519.

Ten age groups were found in the commercial catch (fig. 4 and table 5). Of the males aged in 1958 and 1959, 99 and 97 percent respectively were in the three age groups,

[1] U. S. Fish and Wildlife Service and Alaska Game Commission. 1954. Game fish investigations of Alaska. Quarterly Progress Report, Federal Aid in Fish Restoration, 80 p. [Processed.] On file in Branch of River Basin Studies, Juneau, Alaska.

[2] [U. S.] Fish and Wildlife Service. 1957. A special report on fishery resources of the Kenai Peninsula, 33 p. [Processed.] On file in Branch of River Basin Studies, Juneau, Alaska.

[3] U. S. Fish and Wildlife Service and Alaska Game Commission. 1958. Steelhead trout studies in Alaska. Job Completion Report, Federal Aid in Fish Restoration, 26 p. [Processed.] On file in Branch of River Basin Studies, Juneau, Alaska.

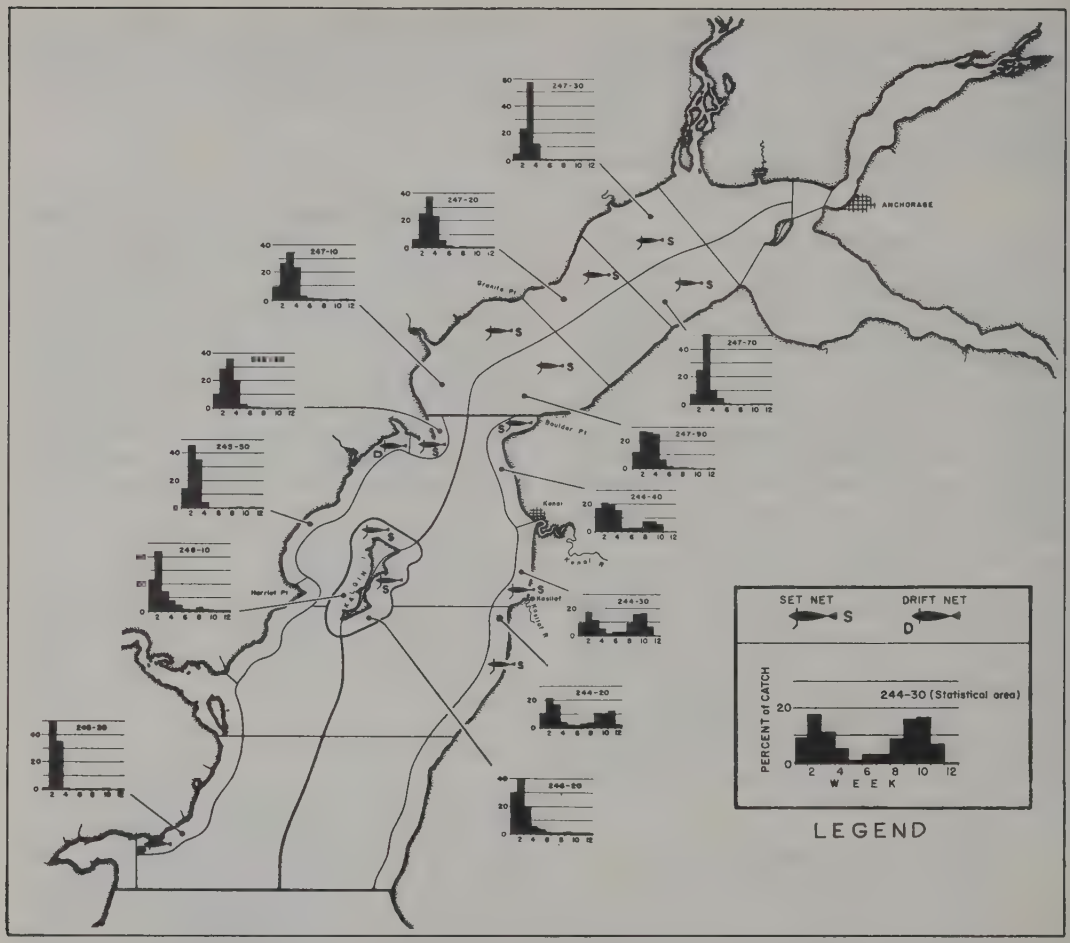

Figure 3.--Weekly commercial catch of king salmon by statistical areas, Cook Inlet, May 24-August 15, 1959.

4_2, 5_2, and 6_2. Fish in these age groups migrate from fresh water to the ocean during their second year of life and return after spending 2, 3, or 4 years in the ocean. In 1958 males in the 6_2 age group predominated and in 1959 in the 5_2 age group. Most of the females in these same years were in the 5_2 and 6_2 age groups.

King salmon usually mature at a greater age the farther north they occur. From California to Southeastern Alaska, the principal ages are 3 (Snyder, 1931) and 4 and 5 (Gilbert, 1914). In Southeastern Alaska the principal ages are also 3, 4, and 5 (Parker and Kirkness, 1956). King salmon in spawning runs of the Yukon River range in age from 5 to 7 years (Gilbert, 1922). The span of dominant ages for king salmon in Cook Inlet is from 4 to 6 years, which fits this northerly trend of increased age at maturity.

In most age groups the average length of males was less than that of females (table 5). The minimum length for males was usually less than for females of the same age, and the maximum length for males was usually more than for females of the same age (fig. 5).

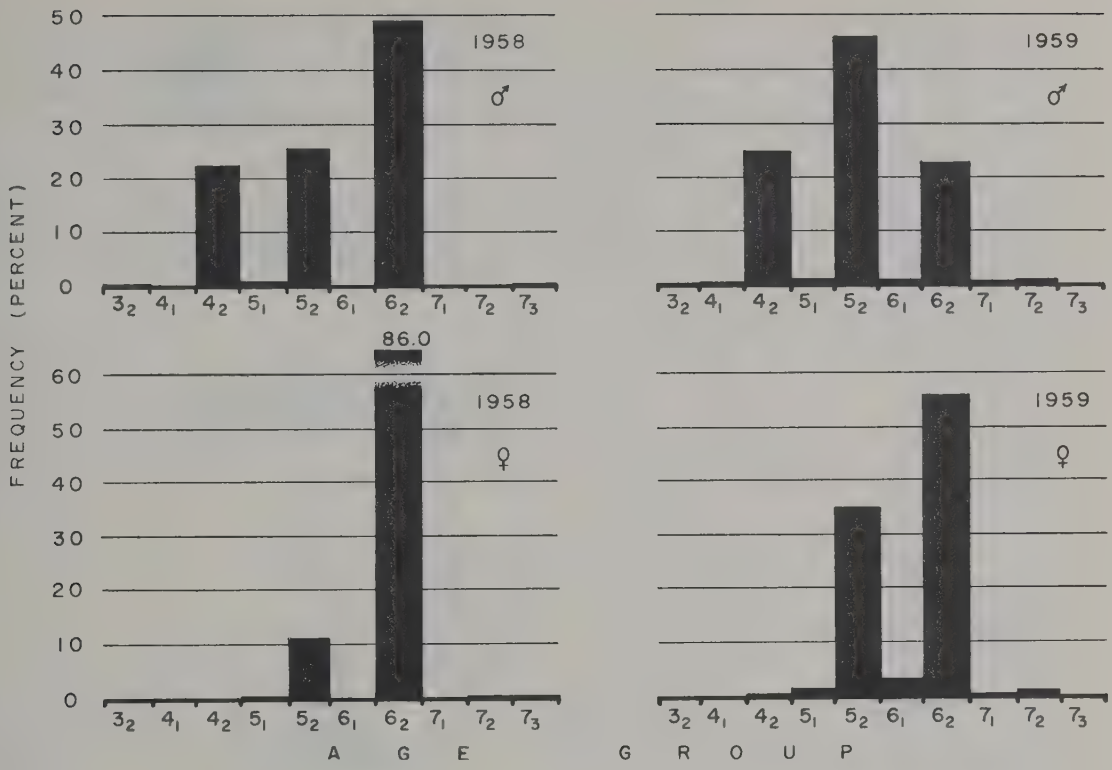

Figure 4.--Age composition of king salmon commercial catch, Cook Inlet, 1958-59.

The average length of all males measured was 809 mm. in 1958 and 724 mm. in 1959, whereas the average length of the females was 887 mm. in 1958 and 845 mm. in 1959. This decrease in mean lengths in 1959 was due to a greater proportion of younger fish.

In 1958 and 1959 males decreased in average length as the season progressed. Females showed no such trend in the same years (figs. 6 and 7). An analysis of variance testing the hypothesis that there were no significant differences in the average lengths of males or females from fishing period to fishing period through June 1959 was made. Results of the test were: for males $F_{8,894} = 9.804$ and for females, $F_{7,794} = 3.285$. Since both "F" values were high, the analysis demonstrates that there were significant differences between some or all of the average lengths tested. No further analysis was made to separate the differences, as no explanation to account for such differences can be made from the data on hand. The mixing of stocks of fish in the commercial fishery obscures any sequence of occurrence, if it exists.

Length-Weight Relationship

Lengths and weights were taken from 63 males and 81 females in 1959. The length-weight relationship was analyzed for each

Table 5.--Lengths of king salmon in 10 age groups in Cook Inlet commercial catch, 1958-59

Age group and year		Males				Females			
		Number	Percent	Length range	Average length	Number	Percent	Length range	Average length
				Mm.	Mm.			Mm.	Mm.
3_2	1958	1	0.5	421	---	0	---	---	---
	1959	1	0.1	605	---	0	---	---	---
4_1	1958	0				0	---	---	---
	1959	3	0.4	575-647	607.7	0	---	---	---
4_2	1958	41	22.5	383-686	568.3	0			
	1959	201	25.4	389-894	613.7	4	0.6	759-940	838.8
5_1	1958	2	1.1	577-780	678.5	1	0.6	854	---
	1959	11	1.4	556-805	673.1	12	1.7	610-990	846.5
5_2	1958	50	26.2	522-1,041	757.3	20	11.1	678-953	805.1
	1959	374	47.2	492-1,055	772.5	256	35.2	673-982	811.4
6_1	1958	0				2	1.1	837-864	850.5
	1959	9	1.1	732-1,080	911.9	30	4.1	735-989	862.1
6_2	1958	92	49.2	554-1,151	923.8	154	86.0	747-989	893.6
	1959	177	22.4	546-1,095	820.5	409	56.3	695-1,005	850
7_1	1958	0				0			
	1959	7	0.9	905-1,045	975.7	4	0.6	872-969	912.5
7_2	1958	0				1	0.6	992	---
	1959	9	1.1	545-1,015	835.9	12	1.7	827-946	880.9
7_3	1958	1	0.5	998	---	1	0.6	881	---
	1959								

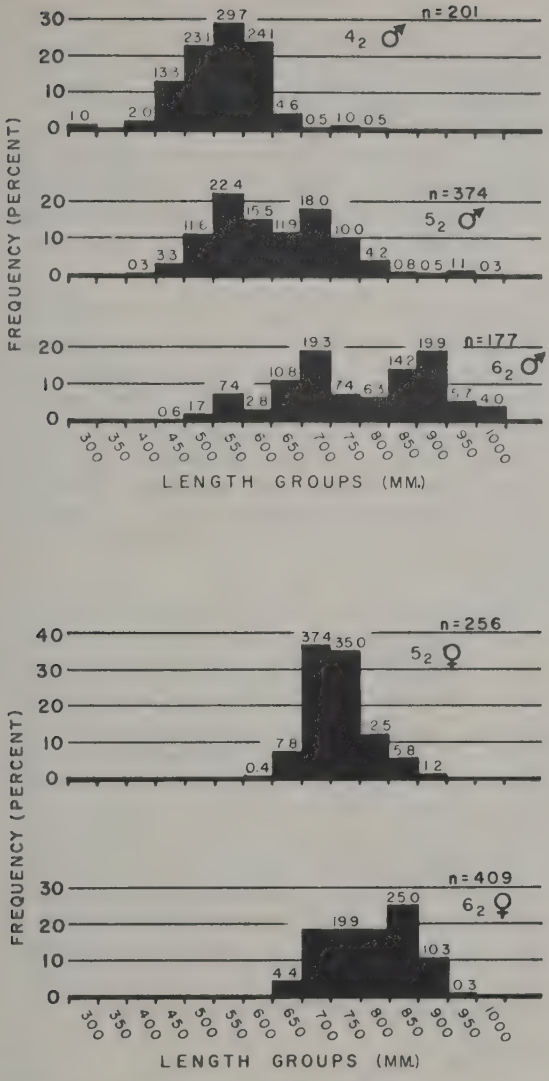

Figure 5.--Length frequency by age and sex, king salmon commercial catch, Cook Inlet, 1959.

sex by standard regression methods (fig. 8).

Fecundity

Ovaries were taken from 60 females ranging in length from 667 to 1,005 mm. (table 6). The ovaries were wrapped in cheesecloth with a label and preserved in formalin. The eggs were separated from the membranes at the time of counting. The number of eggs per fish, determined by actual count, ranged from 4,242 to

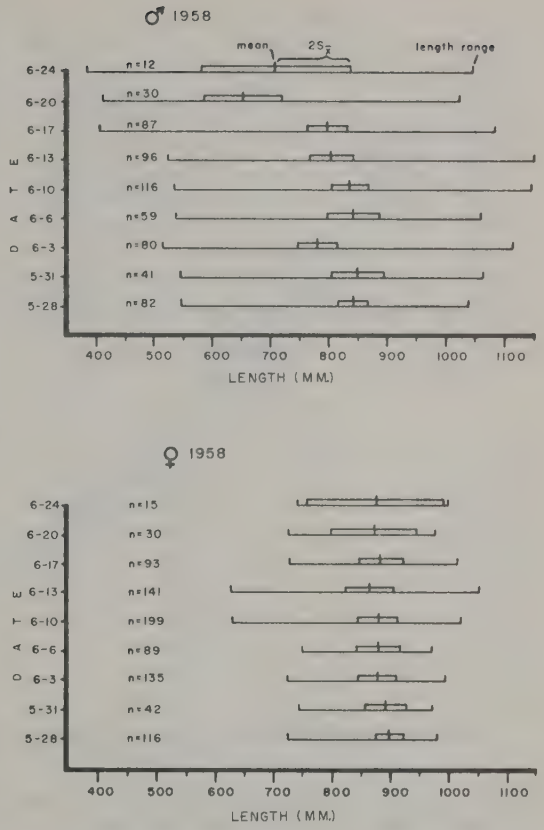

Figure 6.--Lengths of king salmon in 1958 Cook Inlet commercial catch by sex and by fishing period.

13,619. The average number of eggs per females was 8,517.

The linear regression of number of eggs on length is significant: r = 0.8105 (fig. 9).

The average number of eggs in female king salmon from Cook Inlet appears to be the highest recorded on the eastern shore of the Pacific Ocean.

DISTRIBUTION, TIMING, AND RELATIVE MAGNITUDE OF ESCAPEMENT

Surveys were made in 1958 to gain knowledge of the distribution, timing, and relative magnitude of king salmon spawning runs into the river systems tributary to Cook Inlet. As this was the first effort of this kind in the area,

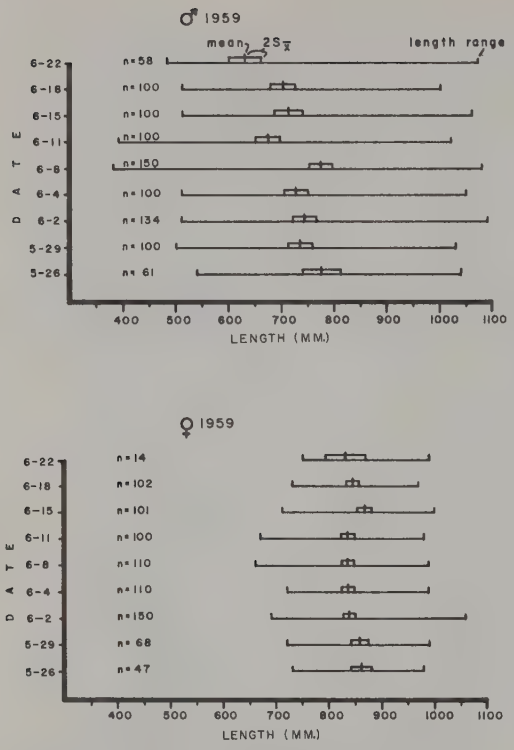

Figure 7.--Lengths of king salmon in 1959 Cook Inlet commercial catch by sex and by fishing period.

the approach was many-sided and involved test fishing and stream surveys by air and on foot. The surveys were augmented by interviews with local residents.

Distribution

There are many glacial streams tributary to Cook Inlet in which salmon cannot be detected visually because of extreme turbidity. It is necessary for purposes of management as well as to gain knowledge of distribution to learn if such streams are actually utilized by salmon.

King salmon were thought to spawn in five glacial streams on the northwest shore of the inlet. To demonstrate utilization by king salmon, these streams were fished with a 75-foot gill net with three panels of 4-, 6-, and 8 1/2-inch mesh to capture adults, and with a small-mesh beach seine to capture fry and fingerlings. The streams and dates fished were: Drift River, May 23 - 29; Katnu River, June 1 - 3; McArthur River, May 31 - June 3; Chakachatna River, May 31 - June 3; and Kustatan River, June 4 - 6. No adults were captured, but fingerlings were taken in the Katnu, McArthur, and Chakachatna Rivers. We cannot say positively whether king salmon use the Drift and Kustatan Rivers because of the short time these two streams were fished.

The largest drainage system in the Cook Inlet area and the one that supports the largest king salmon runs is the Susitna River Basin with an area of about 19,000 square miles. The Susitna River and its five main tributaries--the Talkeetna, Chulitna, Tokichitna, Yentna, and Skwentna Rivers--have a combined length of about 750 miles. Most of our survey effort was on this drainage (table 7).

Streams on the Kenai Peninsula shore of Cool Inlet, in Turnagain and Knik Arms, and along the northwest shore of Cook Inlet were surveyed from the air and on foot (table 7). Most of the area was surveyed from the air because of limitations on time and the difficulty of traveling by boat and on foot. Most of the main streams were turbid from glacial silt, and only the clear tributaries where the fish could be seen were surveyed. King salmon were observed in tributary spawning areas at elevations from 2,500 to 3,000 feet. As far as we could determine, all of the king salmon streams in the Cook Inlet district lie north of Anchor Point.

Timing

The timing of the escapement into most systems was difficult to determine because of glacial silt and because the first king salmon observed were schooling at the mouths of the clear tributaries. This behavior seemed to hold throughout a system. Small groups split off at each stream until the smallest streams used by king salmon were reached. In the smallest streams, the ultimate spawning unit frequently consisted of only two or three pairs of fish.

In the lower Susitna River basin, king salmon were seen in the Deshka River as early as the end of May (table 7). They appeared

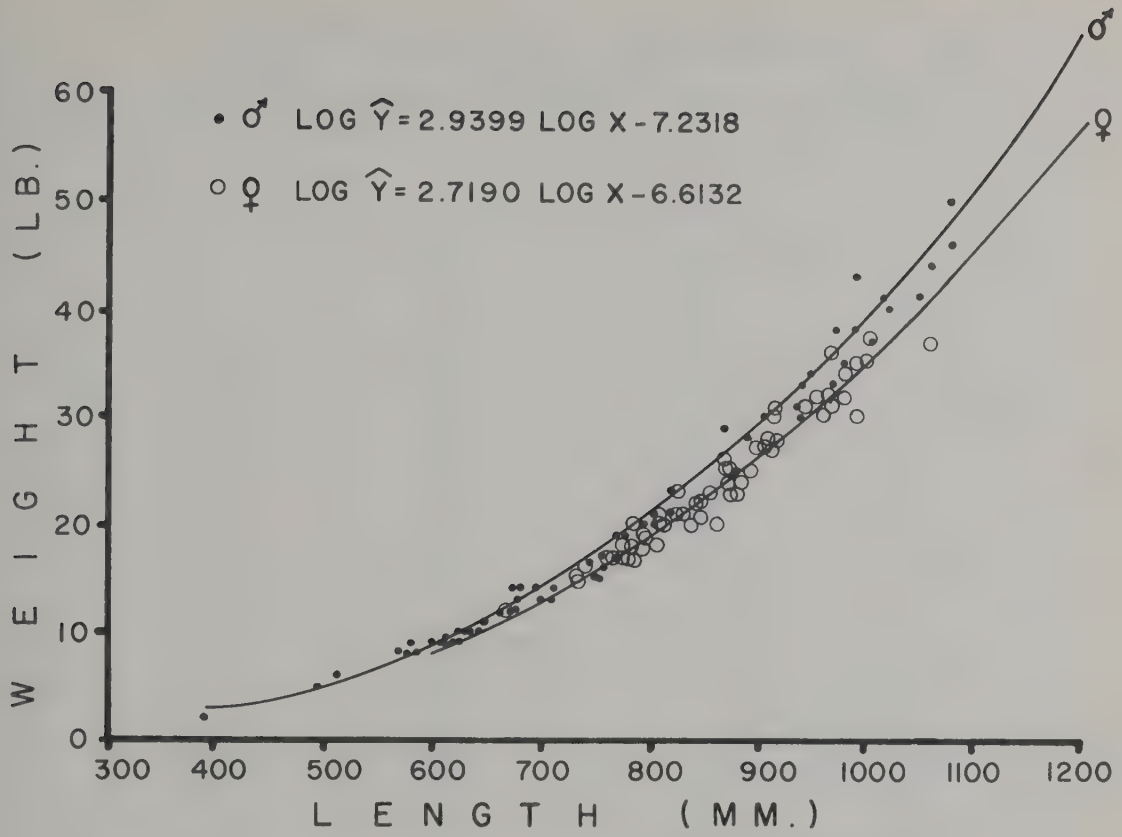

Figure 8.--Length-weight relationship of Cook Inlet king salmon, 1959.

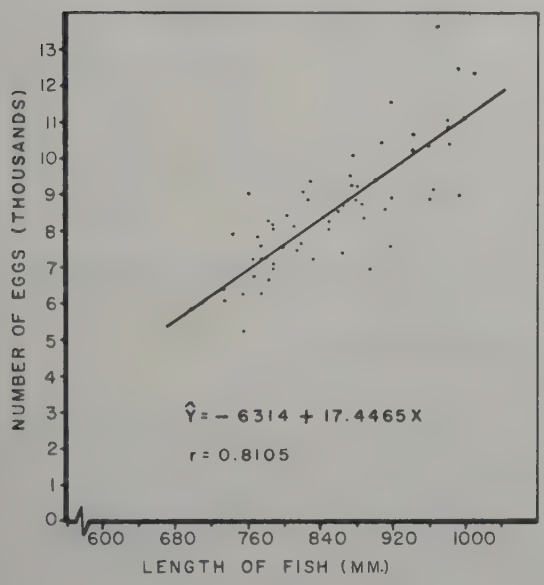

Figure 9.--Regression of number of eggs on length, Cook Inlet king salmon, 1959.

Table 6.--Length, weight, and fecundity of 60 female king salmon in four age groups, Cook Inlet, 1959

Age	Length	Weight	Eggs	Age	Length	Weight	Eggs
	Mm.	*Pounds*	*Number*		*Mm.*	*Pounds*	*Number*
5_1	755	16	5,207	6_2 (cont'd)			
5_2	787	18	6,979		786	19	8,185
	773	17	7,594		848	21	8,254
	781	17	8,267		667	12	4,242
	787	17	7,040		798	19	7,553
	779	17	7,253		887	24	8,373
	809	20	8,144		875	24	10,086
	828	23	9,358		877	25	8,858
	859	23	8,597		802	20	8,410
	894	25	6,948		982	35	10,406
	880	23	9,223		870	26	8,890
	813	21	7,476		967	31	13,619
	734	15	6,051		1,005	37	12,356
	848	22	8,079		959	30	10,306
	767	17	6,759		941	30	10,216
	754	17	6,262		964	32	9,159
					743	16	7,927
6_1	820	21	9,091		826	21	8,877
					979	32	11,032
6_2	918	27	8,956		841	20	8,369
	980	32	10,893		769	17	7,804
	992	31	9,001		774	17	6,277
	884	24	8,745		910	28	8,613
	818	20	7,651		760	17	9,017
	917	30	11,566		831	21	7,238
	942	31	10,666		775	17	7,222
	916	31	7,562		782	18	6,656
	765	17	7,231		864	20	7,423
	733	15	6,396		960	30	8,863
	787	20	8,048		992	35	12,498
	872	25	9,524				
	874	25	9,282				
	907	28	10,451				

in the Yentna and Skwentna systems in the upper Susitna River by July 7. In Resurrection, Sixmile, and Bird Creeks of Turnagain Arm, king salmon appeared about the second and third weeks in June, the same time as they appeared in streams on the Kenai Peninsula. The Beluga River system had king salmon in the clear tributaries in late June and in July, but the fish could not be seen in the river itself because of the turbid water. No king salmon were seen in the Matanuska drainage on a survey flight that was made in July, but residents report use of this system by king salmon.

Relative Magnitude

We were unable to determine if spawning occurred in any of the turbid glacial streams surveyed. Because of this, the vast area involved, and the large number of small tributary streams, we could not estimate the relative magnitude of the escapement in the Cook Inlet area or even between systems.

Table 7.--Results of surveys of Cook Inlet streams to determine distribution, timing, and magnitude of king salmon runs, 1958

Drainage and/or stream surveyed	Date	Type survey	Number salmon	Remarks
Kenai Peninsula				
Anchor River	June 14	Foot	3	Local reference; peak of run over.
Do.	June 15	do.	0	
Stariski Creek	June 16	do.	0	
Deep Creek	June 17	do.	4	
Do.	June 18	do.	1	
Do.	July 24	Aerial	16	Full length of stream.
Ninilchik River	June 18	Foot	1	Local reference; run over.
Turnagain Arm				
Resurrection Creek	June 19	Foot	0	Local reference; fish seen this date.
Sixmile Creek	June 19	do.	0	Do.
Bird Creek	June 23	do.	0	Local reference; usually fish by this date.
Matanuska River	July 3	Aerial	0	Residents report king salmon use river.
Little Susitna River	July 2	do.	14	Headwaters to 2 miles below Alaska Railroad.
Susitna River				
Tributary, Flathorn Lake	May 19	Foot	1	
Fish Creek	do.	do.	0	No king salmon believed to run in creek.
Willow Creek	May 27	Aerial	0	
Do.	June 9	do.	0	
Do.	June 15	do.	5	At railroad bridge.
Do.	June 23	do.	250	All below railroad bridge.
Do.	June 28	Foot	84	Majority below railroad bridge.
Do.	June 29	do.	20	Within 9 miles of mouth.
Do.	June 30	do.	221	Mouth to 7 1/2 miles from railroad bridge
Do	July 2	do.	236	Mostly below railroad bridge.
Do.	July 4	do.	300	Mostly above bridge to 15 miles up creek.
Do.	June 15	Aerial	0	
Do.	June 23-4	Foot	0	
Do.	June 28	do.	53	Three in creek, 50 at mouth.
Do.	July 1	do.	7	In pools near railroad bridge.
Do.	July 27	do.	27	In pools 4 to 7 miles up creek.
Do.	July 2	do.	85	Half mile up creek from mouth.
Do.	July 4	do.	50	Between mouth and railroad bridge.
Kashwitna River	July 4	do.	0	Water turbid.
Caswell Creek	June 10	do.	0	This creek of little importance.
Goose Creek	May 27	do.	0	Creek had run before 1950 when railroad diverted stream. Run ceased 1952.
Do.	June 4	do.	0	Do.
Do.	June 10	do.	0	Do.
Do.	June 15	do.	1	Above railroad bridge at mouth of creek.
Do.	July 11	do.	1	Do.
Sheep Creek	June 15	Aerial	200	Near mouth.
Do.	June 23	do.	200	Do.
Do.	June 28	do.	134	Eighty-five at mouth; others up creek.
Do.	July 4	do.	100	Majority above railroad bridge.
Do.	July 5-9	do.	12	Near mouth; water turbid.
Do.	July 12	do.	122	All above railroad bridge.
Montana Creek	May 24	do.	0	Water low.
Do.	June 4	do.	1	
Do.	June 5	Foot	1	
Do.	June 10	do.	0	
Do.	June 23	do.	0	
Do.	June 28	do.	0	
Do.	July 4	do.	4	Several miles up creek.
Do.	July 11-13	do.	43	Evenly distributed 8 1/2 miles up creek.
Birch (Fish) Creek	---	---	---	Local reference; no king salmon in creek.
Question Creek	July 15	Foot	0	Creek of little importance.
Sunshine Creek	June 10	do.	0	Do.
Answer Creek	July 15	do.	0	Do.
Unnamed creek	July 21	Aerial	7	Eleven miles southwest of Youngstown.

Table 7.--Results of surveys of Cook Inlet streams to determine distribution, timing, and magnitude of king salmon runs, 1958--Continued

Drainage and/or stream surveyed	Date	Type survey	Number salmon	Remarks
Susitna-Talkeetna				
Chunilna Creek	---	---	---	Local reference; good king salmon creek;
Chunilna Creek (right branch)	July 11	Aerial	3	first fish appear July 9.
Disappointment Creek	August 1	do.	5	Several clear tributaries not checked.
Lane (Tom) Creek	July 17	Foot	5	Mile 240 Alaska Railroad.
Susitna-Chulitna				
Chulitna River	July 11	do.	3	In seepage near mouth Hidden River.
Do.	July 20-21	do.	0	Very turbid.
Troublesome Creek	July 7	Aerial	100	In Chulitna River near mouth of creek.
Do.	July 11	do.	45	All in mouth of creek.
Do.	July 29	Foot	75	All in mouth of creek.
Do.	July 29	do.	12	First mile up creek.
Susitna-Chulitna-Tokichitna				
Tokichitna No. 1	July 25	do.	0	Water clear.
Tokichitna No. 2	July 26	do.	0	Turbid.
Tokichitna No. 6	July 24	do.	0	Water clear.
Tokichitna No. 7	July 26	do.	0	Turbid.
Boulder Creek	July 29	do.	0	
Spink Creek	July 7	Aerial	60	Length of creek.
Do.	July 11	do.	42	Mouth to 3 miles up creek.
Do.	July 31	do.	11	Six dead in lower part of creek.
Alder Creek	July 22	Foot	0	Slightly turbid
Susitna-Yentna				
Moose Creek	August 11	Foot	0	
Kahiltna River	July 23	Aerial	0	
Lake Creek	June 13	---	---	King salmon reported by local residents.
Do.	June 25	---	---	Do.
Do.	June 27	---	---	Do.
Johnson Creek	July 21	Aerial	0	Turbid.
Red Creek	July 21	do.	27	Water clear.
Yentna Feeder	August 10	Foot	0	Water clear.
Cache Creek	July 23	Aerial	0	Turbid.
Susitna-Yentna-Skwentna				
Skwentna River	June 21	Aerial	0	
Do.	June 25	do.	0	
Talachulitna River	June 25	do.	0	Turbid.
Talachulitna Creek	August 29	do.	0	
Hayes River	July 21	do.	0	Five miles surveyed.
Portage Creek	July 7	do.	2	
Do.	July 21	do.	1	
Do.	August 14	do.	0	
Indian River	July 7	do.	31	Spread the length of river.
Do.	July 10	do.	19	Near mouth of river.
Do.	July 11	do.	28	Do.
Do.	August 14	do.	225	At mouth of river.
Small creeks, upper Skwentna	June 25	do.	0	Conditions good for observations.
Alexander Creek	May 27	do.	0	
Do.	May 29	do.	1	
Do.	June 3	do.	0	Halfway up creek.
Deshka River	May 29	do.	3	Five miles up.
Do.	June 1	do.	3	
Do.	June 28	do.	0	
Do.	July 4	do.	0	
Do.	July 23	do.	0	

Table 7.--Results of surveys of Cook Inlet streams to determine distribution, timing, and magnitude of king salmon runs, 1958--Continued

Drainage and/or stream surveyed	Date	Type survey	Number salmon	Remarks
Beluga River				
Pretty Creek	June 25	Aerial	1	Salmon seen near mouth.
Do.	July 21	do.	1	Salmon seen half way up river.
Do.	August 11	Foot	0	
Olson Creek	July 1	Aerial	2	Salmon seen near mouth.
Do.	July 21	do.	0	
Coal Creek	June 25	do.	0	Salmon in lower 12 miles of creek.
Do.	July 21	do.	8	Salmon 15 miles up first west tributary.
Nikolai Creek	June 19	do.	0	Water clear.
Chakachatna River				
Chakachatna River	June 19	do.	0	
Straight Creek	June 19	do.	0	Water clear.
Redoubt Bay				
Kustatan River	May 28	do.	0	Water clear.
Jenson Slough	June 9	do.	0	Water clear.

SUMMARY

1. Cook Inlet king salmon are taken in commercial, personal-use, and sport fisheries. The commercial catch has declined despite shortened commercial fishing seasons and restrictions on the length of gear and size of mesh. The 1958 personal-use catch was estimated to be 951 cases. The sport fishery catch is unknown, but there is evidence to show that this fishery has increased in size within the past decade.

2. The peak weekly catch occurs earlier in areas near the latitude of Anchor Point than the peak catch in the inner areas of Cook Inlet. A second run later in the season into streams on the Kenai Peninsula south of Boulder Point is indicated.

3. Ten age groups were found in the commercial catch, with groups 4_2, 5_2, and 6_2 occurring most frequently. Age group 6_2 was dominant in 1958, 5_2 in 1959.

4. Males were found to be smaller on the average than females. A shift to a smaller average size from 1958 to 1959 in both sexes was associated with the shift in age-group dominance.

5. In both 1958 and 1959, the lengths of males increased as the season progressed.

6. In 1959, the number of eggs per fish, determined by actual count, ranged from 4,242 to 13,619, with an average of 8,517. The linear regression of the number of eggs on length was significant.

7. Surveys made in 1958 to determine the distribution, timing, and relative magnitude of the escapement were not completely successful because of turbid glacial streams, the large number of small streams, and the vast area involved. Escapement data are presented. Spawning king salmon were found widely distributed on the periphery of the Cook Inlet drainage basin. The pattern of spawning run behavior, that of schools splitting into smaller and smaller groups into smaller and smaller streams, may be linked to the present decline.

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